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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,081	09/09/2003	Kazuo Akamatsu	01-065-DIV	9172
23400	7590	08/25/2004	EXAMINER	
POSZ & BETHARDS, PLC 11250 ROGER BACON DRIVE SUITE 10 RESTON, VA 20190			VU, HUNG K	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 08/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/657,081	<b>Applicant(s)</b> AKAMATSU ET AL.	
	<b>Examiner</b> Hung K. Vu	<b>Art Unit</b> 2811	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____.  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>9/9/03</u> .  | 6) <input type="checkbox"/> Other: ____.                                    |

## **DETAILED ACTION**

### ***Claim Objections***

1. Claims 1-3 and 5-8 are objected to because of the following informalities:

In claims 1 and 5-8, many occurrences, “spattering” should be changed to “sputtering” for clarity.

In claims 2, 3 and 5-8, line 1, “an electric” should be changed to “the electric” for clarity.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 6 and 7 are rejected under 35 U.S.C. 102(a) as being anticipated by Liu et al. (PN 6,099,701, of record).

Liu et al. discloses, as shown in Figure 2 and Tables 1-3, a method of manufacturing an electric wiring of a semiconductor device including a semiconductor element formed on a semiconductor substrate and an aluminum alloy wiring connected to the semiconductor element on the semiconductor substrate, the method comprising:

forming an aluminum alloy layer (40) on the semiconductor substrate, the aluminum alloy layer containing metal (Cu) which restricting an movement of aluminum;

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forming TiN film (44) on the aluminum alloy layer by using sputtering, the sputtering being conducted using TiN as a target and being conducted without containing N<sub>2</sub> gas in an atmosphere surrounding the semiconductor substrate.

With regard to claim 7, Liu et al. discloses the step of forming TiN film on the aluminum alloy layer including:

first sputtering the TiN film (44) by using the TiN formed on the surface of the Ti target in atmosphere without containing N<sub>2</sub> gas;

second sputtering another TiN film (46) of the TiN formed in the first sputtering in the atmosphere containing N<sub>2</sub> gas, after the TiN is formed on an entire surface of the aluminum alloy layer in the first sputtering.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (PN 6,099,701, of record) in view of Yamaoka et al. (PN 6,066,891, of record).

Liu et al. discloses the claimed invention including the method of manufacturing an electric wiring of a semiconductor device. Liu et al. further discloses the DC plasma power of sputtering. Liu et al. does not disclose the DC power of sputtering is set to equal to or less than

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5.5 W/cm<sup>2</sup>. However, Yamaoka et al. discloses a method of manufacturing an electric wiring of a semiconductor device comprising forming TiN film with DC power of sputtering is set to equal to or less than 5.5 W/cm<sup>2</sup>. Note Col. 6, lines 9-10, Col. 13, lines 13-16. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to set the DC power of sputtering is set to equal to or less than 5.5 W/cm<sup>2</sup>, such as taught by Yamaoka et al. in order to form a TiN film being rich with reactivity and to sufficiently suppress the occurrence of alloy spike.

With regard to claim 2, Liu et al. and Yamaoka et al. discloses the TiN film is formed to have a thickness of between about 5 and 15 nm (within a range of 5 nm or more, Col. 5, lines 33-35)

With regard to claim 3, Liu et al. and Yamaoka et al. discloses the TiN film is formed under a condition where a temperature of an atmosphere surrounding the semiconductor substrate during the sputtering is approximately 25 to 300°C (within a range of 180°C or less, Table 3).

With regard to claim 5, Liu et al. and Yamaoka et al. discloses the sputtering is conducted by using TiN, formed on a surface of a Ti target, as the target of the sputtering.

With regard to claim 7, Liu et al. and Yamaoka et al. discloses the step of forming TiN film on the aluminum alloy layer including:

first sputtering the TiN film (44) by using the TiN formed on the surface of the Ti target in atmosphere without containing N<sub>2</sub> gas;

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second sputtering another TiN film (46) of the TiN formed in the first sputtering in the atmosphere containing N<sub>2</sub> gas, after the TiN is formed on an entire surface of the aluminum alloy layer in the first sputtering.

***Conclusion***

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (571) 272-1666. The examiner can normally be reached on Mon-Thurs 6:00-3:30, alternate Friday 7:00-3:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The Central Fax Number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

August 6, 2004

A handwritten signature in cursive script, appearing to read "Hung Vu", is written over a horizontal line.

Hung Vu

Patent Examiner